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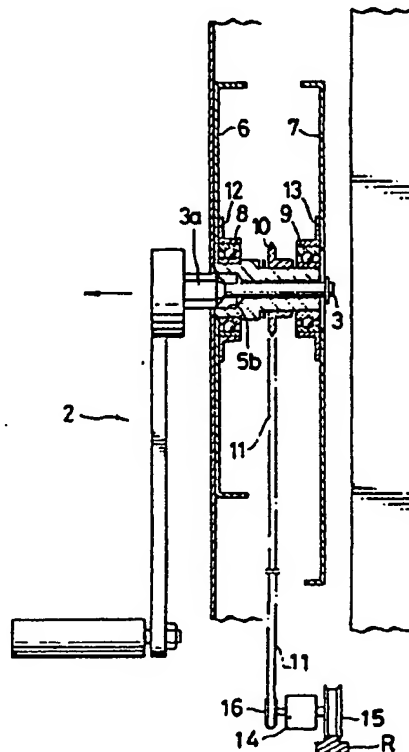
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(58) Field of search
A4B

(54) Mobile shelf system

FIG. 4

(57) A mobile shelf system includes a plurality of shelf units (1, Fig. 1.) movably mounted on guide rails R with an access aisle created between desired adjacent shelf units (1). Each of the shelf units (1) has a manually rotatable handle 2 connected to a core shaft 3 fitted in a support shaft 5, Fig. 2 rotatably supported on a side wall of the shelf unit (1). An endless chain 11 is trained around a chain sprocket 10 fixedly mounted on the support shaft (5) and a sprocket 16 of a speed reducer mechanism 14 which drives a wheel 15 rollingly riding on one of the rails R. The core shaft 3 has a hexagonal power-transfer boss 3a and is axially movable in the support shaft (5) between a first position in which the boss 3a engages in a hexagonal socket 5b in the support shaft (5) to transmit rotation from the core shaft 3 to the speed reducer mechanism 14 and a second position in which the boss 3a is out of driving engagement with the socket 5b.



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FIG. 1

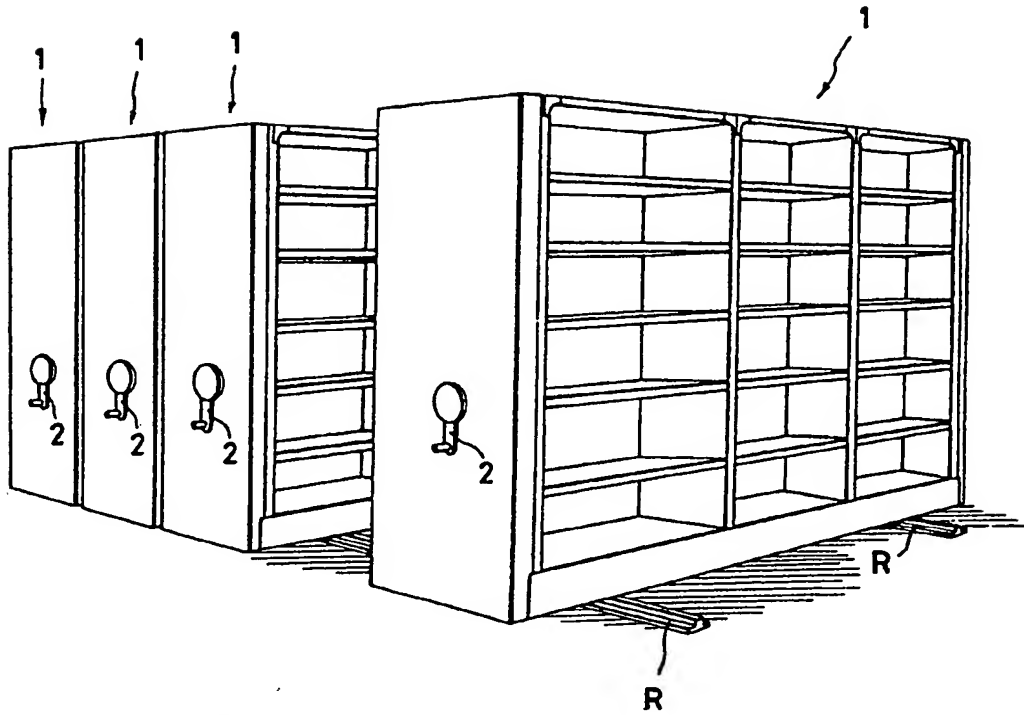


FIG. 5

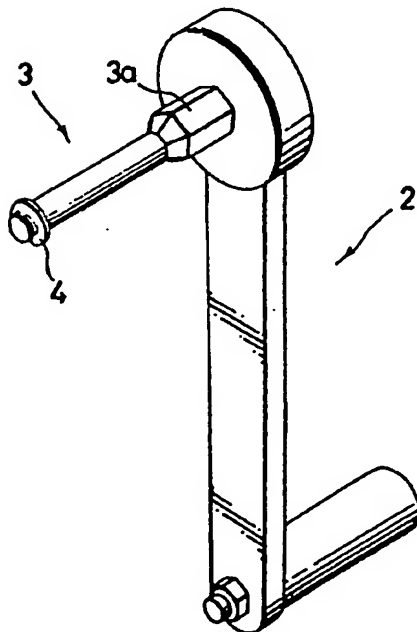
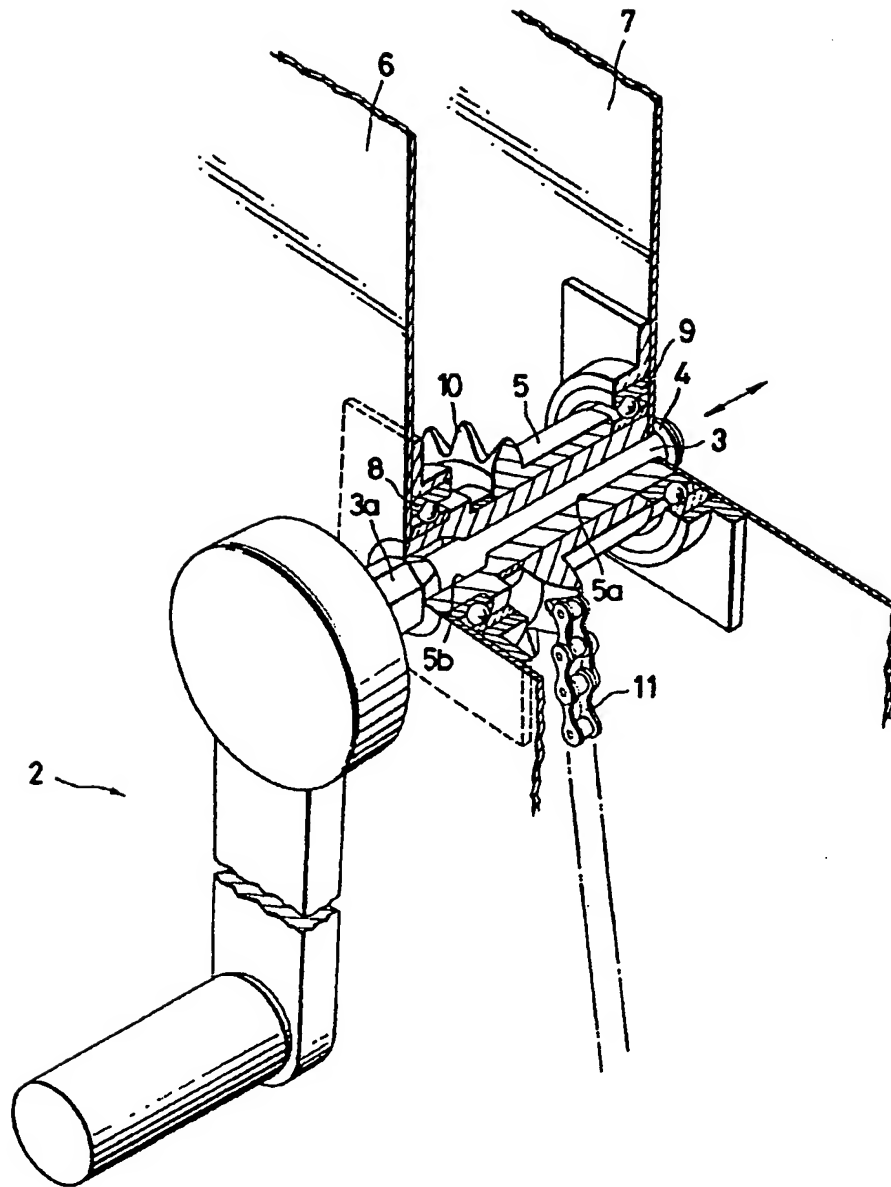


FIG. 2



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FIG. 4

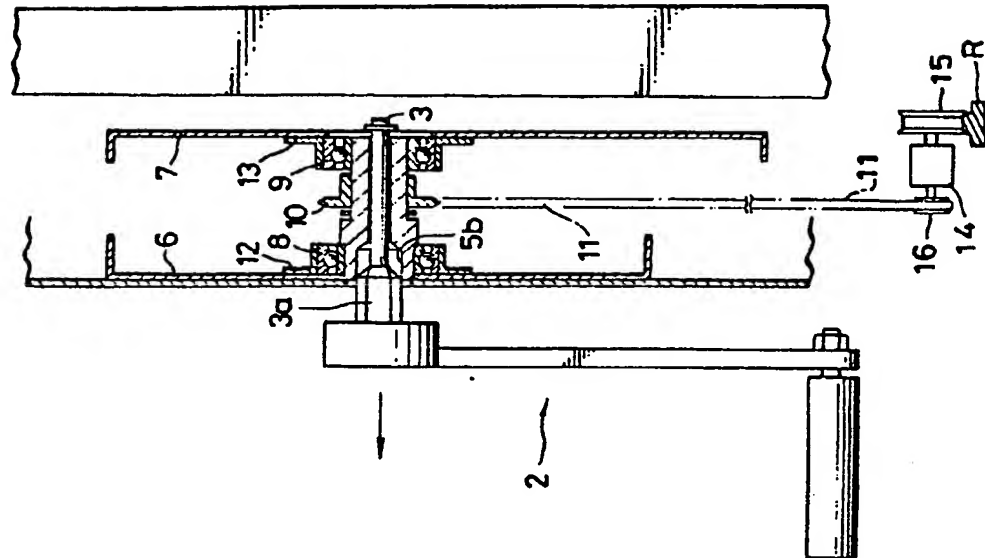
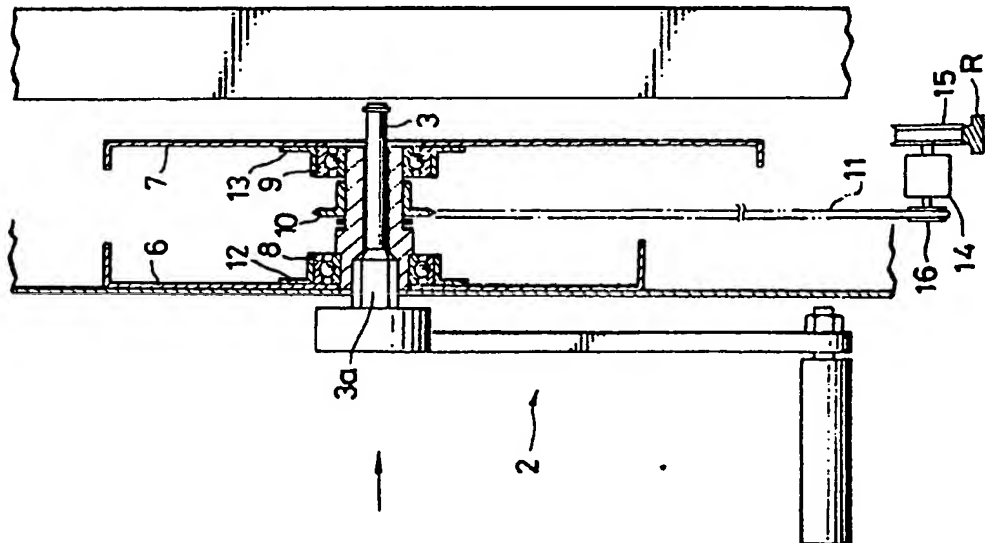


FIG. 3



SPECIFICATION

Mobile Shelf System

5 The present invention relates to a mobile shelf system including a plurality of shelf units movably mounted on guide rails on a floor.

There have been developed mobile shelf systems in which a plurality of movable shelf units are carried on guide rails on a floor and movable independently to create an access aisle between any desired adjacent shelf units for allowing a user to walk through the access aisle. The access aisle permits the user to access any desired shelf for taking an object or objects into and out of the desired shelf.

One known mobile shelf system is constructed as follows: Each of the shelf units of the mobile shelf system has a rotatable shaft extending through a side wall of the shelf unit. A manually rotatable handle has a proximal end fixed to an outer end of the shaft which supports a sprocket on an inner end thereof. The sprocket is operatively coupled by an endless chain to another sprocket of a speed reducer mechanism for driving wheels or rollers rotatably mounted on a shelf bottom and riding on the rails. In operation, the wheels are caused by the chain to rotate and roll on the rails when the manually rotatable handle is rotated.

With the known arrangement, the shaft on which the manually rotatable handle is mounted and a shaft supporting the wheels are ganged for corotation at all times. When one of several shelf units which are in mutual abutment is moved, the shelf unit or units which precede the one moved are also forcibly pushed, with their handles rotating. Therefore, the handles are simultaneously rotated on all of the shelf units which are forcibly moved by the shelf unit that is moved by the user. One of the problems with the prior shelf system is that the concurrent rotation of all of the handles on the pushed shelf units is unsightly. Another problem is that while the handle of the desired shelf unit is being rotated by the user, the speed reducer mechanisms in the pushed shelf units are also driven, requiring the user to exert an increased force to rotate the handle.

It is desirable therefore to provide a mobile shelf system in which when one of a plurality of shelf units movably mounted on rails is moved, manually rotatable handles on those shelf units which are forcibly moved thereby are kept nonrotatable.

According to the present invention, there is provided a mobile shelf system comprising a plurality of parallel guide rails, a plurality of shelf units movably mounted on the guide rails, each of the shelf units including a side wall, a core shaft extending through and rotatably supported on the side wall, a manually rotatable handle secured to one end of the core shaft, a speed reducer mechanism selectively drivable in response to rotation of the handle and having a wheel rollingly riding on one of the rails, a support shaft rotatably mounted on the side wall and fitted over the core shaft,

means on the support shaft for driving the speed reducer mechanism in response to rotation of the support shaft, the core shaft having a power-transfer boss selectively engageable with the support shaft and movable axially between a first position in which the power-transfer boss engages the support shaft for transmitting rotation of the handle to the speed reducer mechanism and a second position in which the power-transfer boss is out of driving engagement with the support shaft.

An embodiment of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a mobile shelf system according to the present invention;

Figure 2 is a perspective view, partly cut away of a handle shaft assembly;

Figures 3 and 4 are sectional side elevational views showing steps of operation of the handle shaft assembly; and

Figure 5 is a perspective view of a manually rotatable handle.

As shown in Figure 1, a mobile shelf system is composed of a plurality of shelf units 1 movably mounted on a pair of parallel guide rails R. Each of the shelf units 1 has a crank-shaped manually rotatable handle 2 mounted on a side wall and is movable on and along the rails R when the handle 2 is manually rotated.

In Figure 2, the handle 2 includes a disk-shaped boss having a surface facing the side wall of the mobile shelf unit 1 and secured to one end of a core shaft 3. As illustrated in Figure 5, the core shaft 3 includes a hexagonal power-transfer boss 3a secured to the disk-shaped boss of the handle 2. The hexagonal power-transfer boss 3a is movable in an axial direction of the core shaft 3 between a first position (shown in Figure 3) in which the boss 3a engages a support shaft 5 (described later on) to transmit rotation of the handle 2 to a speed reducer mechanism 14 (Figures 3 and 4) and a second position (shown in Figure 4) in which the boss 3a is disengaged from the support shaft 5. The speed reducer mechanism 14 is operatively coupled to a wheel or roller 15 rotatably mounted in the shelf unit 1 and rollingly riding on one of the rails R.

The support shaft 5 is of a tubular construction relatively rotatably fitted over the core shaft 3. An E-shaped retaining ring 4 is mounted on an end of the core shaft 3 remote from the boss 3a to prevent the core shaft 3 from being dislodged out of the support shaft 5 when the core shaft 3 is displaced to the second position. The E-ring 4 may not be attached to the core shaft 3 so that the core shaft 3 can be removed from the support shaft 5 after the core shaft 3 has been set in the second position.

The support shaft 5 engageable with the power-transfer boss 3a of the core shaft 3 is rotatably supported at its axial ends by a pair of ball bearings 3, 9 mounted in support panels 6, 7, respectively, in the side wall of the shelf unit 1. The tubular support shaft 5 has a central bore 5a in which the core shaft 3 is rotatably supported. The

central bore 5a includes a socket 5b defined in a longitudinal end thereof adjacent to the handle 2, the socket 5b being hexagonally shaped in complementary relation to the hexagonal power-transfer boss 3a. The boss 3a and the socket 5b jointly serve as a means for connecting and disconnecting the core shaft 3 and the support shaft 5.

A chain sprocket 10 is securely mounted on and around the support shaft 5. An endless chain 11 is trained around the chain sprocket 10 and a sprocket 16 (Figures 3 and 4) of the speed reducer mechanism 14. The support shaft 5 and the speed reducer mechanism are therefore rotatable in unison through the endless chain 11.

The ball bearings 8, 9 are fitted in and supported by bearing housings 12, 13, respectively, attached to the support panels 6, 7, respectively.

When the core shaft 3 is axially displaced to the first position shown in Figure 3 in which the boss 3a engages in the socket 5b, rotation of the handle 2 is transmitted through the boss 3a and the socket 5b to the support shaft 5 secured to the core shaft 3, and thence from the support shaft 5 through the chain sprocket 10 and the chain 11 to the speed reducer mechanism 14. The shelf unit 1 is now moved on the rails R by the wheel driven by the speed reducer mechanism 14.

When the core shaft 3 is axially displaced to the second position shown in Figure 4 in which the boss 3a is placed out of engagement with the socket 5b, the core shaft 3 and the support shaft 5 are separated and no rotation will be transmitted from the support shaft to the core shaft 3.

Even if the wheel is rotated by being pushed by an adjacent shelf unit 1 while the core shaft 3 is in the second position, the core shaft 3 and hence the handle 2 are not rotated although the chain sprocket 10 and the support shaft 5 are rotated through the speed reducer mechanism 14 by the wheel 15.

The power-transfer boss 3a may be located on the core shaft 3 in an axial position other than the end adjacent to the disk-shaped boss of the handle 2, and so may be the socket 5b.

The boss 3a and the socket 5b may be of other polygonal shapes provided they can interfit to transmit rotation from the core shaft 3 to the support shaft 5 without slippage.

CLAIMS

1. A mobile shelf system comprising a plurality of parallel guide rails, a plurality of shelf units movably mounted on said guide rails, each of said shelf units including a side wall, a core shaft extending through and rotatably supported on said side wall, a manually rotatable handle secured to one end of said core shaft, a speed reducer mechanism selectively drivable in response to rotation of said handle and having a wheel rollingly riding on one said rails, a support shaft rotatably mounted on said side wall and fitted over said core shaft, means on said support shaft for driving said speed reducer mechanism in response to rotation of said support shaft, said core shaft having a power-

transfer boss selectively engageable with said support shaft and movable axially between a first position in which said power-transfer boss engages said support shaft for transmitting rotation of said handle to said speed reducer mechanism and a second position in which said power-transfer boss is out of driving engagement with said support shaft.

2. A mobile shelf system according to claim 1, wherein said power-transfer boss is hexagonal in shape, said support shaft having a hexagonal socket complementary in shape to said power-transfer boss for receiving said power-transfer boss therein when said core shaft is in said first position.

3. A mobile shelf system according to claim 1 or 2 wherein said manually rotatable handle comprises a crank-shaped handle.

4. A mobile shelf system according to any one of the preceding claims, wherein said driving means comprises a chain sprocket fixedly mounted on said support shaft and an endless belt trained around said chain sprocket and said speed reducer mechanism.

5. A mobile shelf system according to any one of the preceding claims, wherein said side wall comprises a pair of spaced side panels, said support shaft being rotatably supported by respective bearings on said side panels, respectively.

6. A mobile shelf system comprising a plurality of parallel, wheeled shelf units, each movably mounted on guide rails, each unit having a cranking handle connected to a rotatable shaft mounted on a side wall, transmission means for transmitting motion from said rotatable shaft to the wheels of said shelf unit, and clutch means for selectively engaging the handle with said transmission means, which clutch means is normally disengaged so that if the shelf unit is moved by being pushed by an adjacent unit its handle does not rotate.

7. A mobile shelf unit substantially as herein described with reference to the accompanying drawings.

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